100321

STANDARD CHLORINE OF DELAWARE, INC.

PHASE IA CULTURAL RESOURCES ASSESSMENT
FINAL REPORT

(PURCHASE ORDER NO. 03035230-01)

JUNE 1993

STANDARD CHLORINE OF DELAWARE, INC.

PHASE IA CULTURAL RESOURCES ASSESSMENT FINAL REPORT

(PURCHASE ORDER NO. 03035230-01)

Christopher L. Nagle, Ph.D.

Stephen G. Del Sordo

and

Janet L. Friedman, Ph.D.

DAMES & MOORE, INC.
CULTURAL RESOURCE SERVICES
7101 WISCONSIN AVENUE, SUITE 700
BETHESDA, MARYLAND 20814

JUNE 1993

Table of Contents

List of Figures

List of Tables

Appendices

1.0 Management Summary

Dames & Moore conducted a Phase I(A) cultural resource investigation for Standard Chlorine of Delaware, Inc. (SCD) in Delaware City, Delaware. An area of approximately twenty-five acres will be impacted by ground-disturbing activities carried out as part of the Remedial Investigation/ Feasibility Study (RI/FS) being performed by SCD to remove toxic materials that have been accidentally released. The purpose of this phase of cultural resource investigation is to identify historic properties that may be impacted by the undertaking, in compliance with Section 106 of the National Historic Preservation Act.

To perform the evaluation, Dames & Moore: (1) carried out a comprehensive archival and document search to identify known or potential historical, architectural, and/or archeological resources within the study area; and (2) conducted a walkover survey with limited shovel and trowel testing to locate visible cultural features, artifacts, and above-ground resources, to isolate areas that are severely disturbed, and to identify areas with a high probability of containing significant cultural resources.

The project area is situated immediately to the north of the SCD plant site in Delaware City, New Castle County, Delaware. It is about evenly divided between relatively flat terrain and moderate slopes overlooking Red Lion Creek to the north and an unnamed tributary of Red Lion Creek to the west. The level topography of portions of the project area and its location above the creek make it a candidate for past occupation.

Inspection of records at the Delaware Division of Historical and Cultural Affairs revealed that the only site on record in the project area is a report by Delaware State Archeologist Faye Stocum of finding flakes and fire-cracked rock upslope from Soil Piles A and B (7NC-E-106) during a prior visit to the area. In addition, there are several historic and prehistoric sites listed in the Division records for the surrounding Red Lion Creek region, illustrating the suitability and attractiveness of the study area for past human occupation.

On November 5th and 6th, 1992, Dr. Christopher L. Nagle and Nathan Knoche of Dames & Moore conducted a walkover and visual inspection of the project area. Most of the level terrain of the project area appears to have been disturbed as a result of cleanup activities conducted in 1986. No cultural features or evidence of past structures were located. One artifact was found, lying on the surface of the ground upslope from Soil Pile A. It is a small sherd of historic pottery, tentatively identified as redware dating to circa A.D. 1751-1818. The previously reported flakes and fire-cracked rock were not relocated by us, nor were additional similar materials found during our visit.

Two small areas on the level portions of the project site were identified as potentially being undisturbed. Dames & Moore recommends that further Phase I(B) archeological testing be carried out to verify the Phase I(A) findings and to assess the extent and degree of ground disturbance throughout the entire 25-acre study area.

2.0 Introduction

Dames & Moore was contracted by Standard Chlorine of Delaware, Inc. (SCD) of Delaware City, Delaware, to perform a Phase I(A) cultural resource investigation of a twenty-five acre area located north of SCD's plant site in Delaware City, New Castle County, Delaware (Figure 1). This area will be impacted by ground-disturbing activities carried out as part of the Remedial Investigation/ Feasibility Study (RI/FS) being performed by SCD to remove toxic materials that have been accidentally released. The purpose of this phase of cultural resource investigation is to assess the project area for the presence or absence of potentially significant archeological or historical materials that may be impacted by the undertaking, in compliance with Section 106 of the National Historic Preservation Act and its implementing Regulations (36 CFR 800).

In 1981, as much as 5,000 gallons of industrial grade monochlorobenzene (MCB) was accidentally spilled at SCD while a railroad tank car was being filled, and the chemical was discharged to the ground around the siding. The State directed SCD to install ten on-site monitoring wells to assess the impact of the spill on groundwater. Serious problems were discovered, indicating a continuing pattern of minor, undetected releases since as early as 1965. As a result of this investigation, SCD completed remedial investigations and corrective actions, including installing ten groundwater monitoring wells, groundwater sampling and analysis, Phase II investigation, and plans for groundwater recovery systems.

In 1986, a tank collapsed, damaging other tanks and spilling approximately 400,000 gallons of paradichlorobenzene (DCB) and 169,000 gallons of trichlorobenzene (TCB). The released material extended into wetland areas north and west of site. An extensive clean-up effort was undertaken, and much of the toxic material was recovered. In addition to the area disturbed as a result of the release, additional acreage was impacted by the cleanup activities, including moving cleanup equipment, building a sedimentation lagoon (to store sediments dredged from Red Lion Creek) and creating a soil pile.

Although the majority of spilled materials were recovered immediately following each event, residuals remain in both the wetlands and in limited areas of upland soils. Several alternatives have been proposed in the Feasibility Study to remediate the impacts to affected sediments and soils. These include: excavation followed by varying degrees of treatment and stabilization prior to emplacement in an on-site impoundment; excavation followed by low temperature thermal desorption; use of treated soils for backfill; and *in-situ* biological treatment.

Each of these alternatives, with the exception of "no action", involves excavation and ground disturbing activities that could impact upon cultural properties located within the twenty-five acre site. Because the RI/FS is required by the Environmental Protection Agency (EPA), it is a Federal undertaking, subject to the requirements of Section 106 of the National Historic Preservation Act of 1966, as amended.

Section 106 is the primary requirement to take into account the impacts of project planning and implementation on potentially significant cultural resources. The National Historic Preservation Act and its implementing regulations (36 CFR 800) establish a requirement and a process for ensuring the consideration in agency planning of historic properties that may be impacted by undertakings of the Federal government.

Section 106 requires the head of any Federal agency to consider the impacts of proposed undertakings on significant historic properties, and to provide the Advisory Council on Historic Preservation (the Council) an opportunity to comment. An undertaking is broadly defined to include "...any project, activity, or program that can result in changes in the character or use of historic properties" (36 CFR 800.2 (o)). Thus, EPA's requirement to carry out an RI\FS is an undertaking in this context.

The Council's regulations lay out the specific procedures for obtaining the Council's comment. The procedures include identifying prehistoric and historic, archeological and structural resources, evaluating their significance, assessing the potential of the project to impact their significance, and developing mitigation measures to reduce or eliminate that impact. This Phase I(A) study is the first step in the process, the initial examination of the literature to identify potential cultural resources in the project area.

3.0 Project Area Setting

The project area lies within the Delaware Shore physiographic zone of Delaware's Upper or High Coastal Plain, as defined by Custer (1986). The High Coastal Plain consists of coarse gravel deposits from the Columbia sediments. Differential erosion of these sediments has produced a rolling topography with up to 50 feet of elevation difference between the headlands bordering larger streams and neighboring floodplain marshes.

The Delaware Shore Zone includes remnant terraces of the Delaware River and various tidal marshes adjoining the river and Delaware Bay itself. Water courses, often deeply incised, are tidal, and the mix of salt and fresh water has made a wide range of resources available. Soils include a variety of well-drained and swampy types distributed in a mosaic across the province. Soils in the Delaware Shore edaphic zone are usually poorly-drained, although pockets of well-drained soils occur at higher elevations.

The Delaware Shore physiographic zone of the Upper Coastal Plain is considerably smaller at present than it was at the end of the Pleistocene, some 12,000 years ago, because of post-Pleistocene sea level rise (Custer 1986:16-17). Rising sea levels along the Atlantic coast of Delaware and the Delaware River and Bay for the past 12,000 years have submerged many old land surfaces and changed the configuration of the river shoreline considerably. The rise in sea levels has, over time, changed the Delaware River into a drowned estuary. In particular, the Delaware Shore Zone would have extended much farther to the east in the past; it has gradually migrated west through time to its present location.

The SCD project area is situated immediately to the north of the SCD plant site (Figure 2). It consists of approximately twenty-five acres of land, about evenly divided between relatively flat terrain and moderate slopes overlooking the tidal estuary of Red Lion Creek to the north and an unnamed tributary of Red Lion Creek to the west. Red Lion Creek drains directly into the Delaware River about one mile to the east. Soils are well-drained. Flat terrain is covered by recent (less than 10-15 years old) secondary growth of shrubs and brush; the slopes (except where cleared during the 1986 paradichlorobenzene cleanup) are mantled by mature forest.

The topography has been altered considerably as a result of activities to clean up the 1986 discharge. Two piles of contaminated soil, each roughly 30 to 50 meters long by 15 meters wide, are located on the upper portion of the west-facing slope above the unnamed tributary. These are referred to as Soil Piles A and B. A sedimentation basin lies on flat ground on the southern boundary of the project area, just outside the SCD plant fence. Several graveled roads are maintained throughout the level areas on top of the hill to provide access to groundwater monitoring wells.

4.0 Research Design

Dames & Moore performed a comprehensive document search to identify any known or potential historical, architectural, and/or archeological resources within the study area. This task included checking current site files at the Delaware State Historic Preservation Office for recorded sites in the project area and consulting historic maps to locate known sites. Information on any known or projected resources was recorded. The staff of the Delaware Division of Historical and Cultural Affairs was consulted about the probability of sites in the project area.

This task also included an evaluation of the differential sensitivity of the area for the presence of cultural resources. The prehistoric and historic Delaware State Historic Preservation management plans were the primary data sources for this evaluation. Other criteria included topography, distance to water source and other determinants of prehistoric and historic occupation.

Field work for the project included a one-time site inspection, entailing a walkover survey in parallel transects. The purpose of this walkover was to visually inspect the property to locate visible archeological features, artifacts, and standing structures, to identify areas that are severely disturbed, and to locate areas with a high probability of containing significant cultural resources.

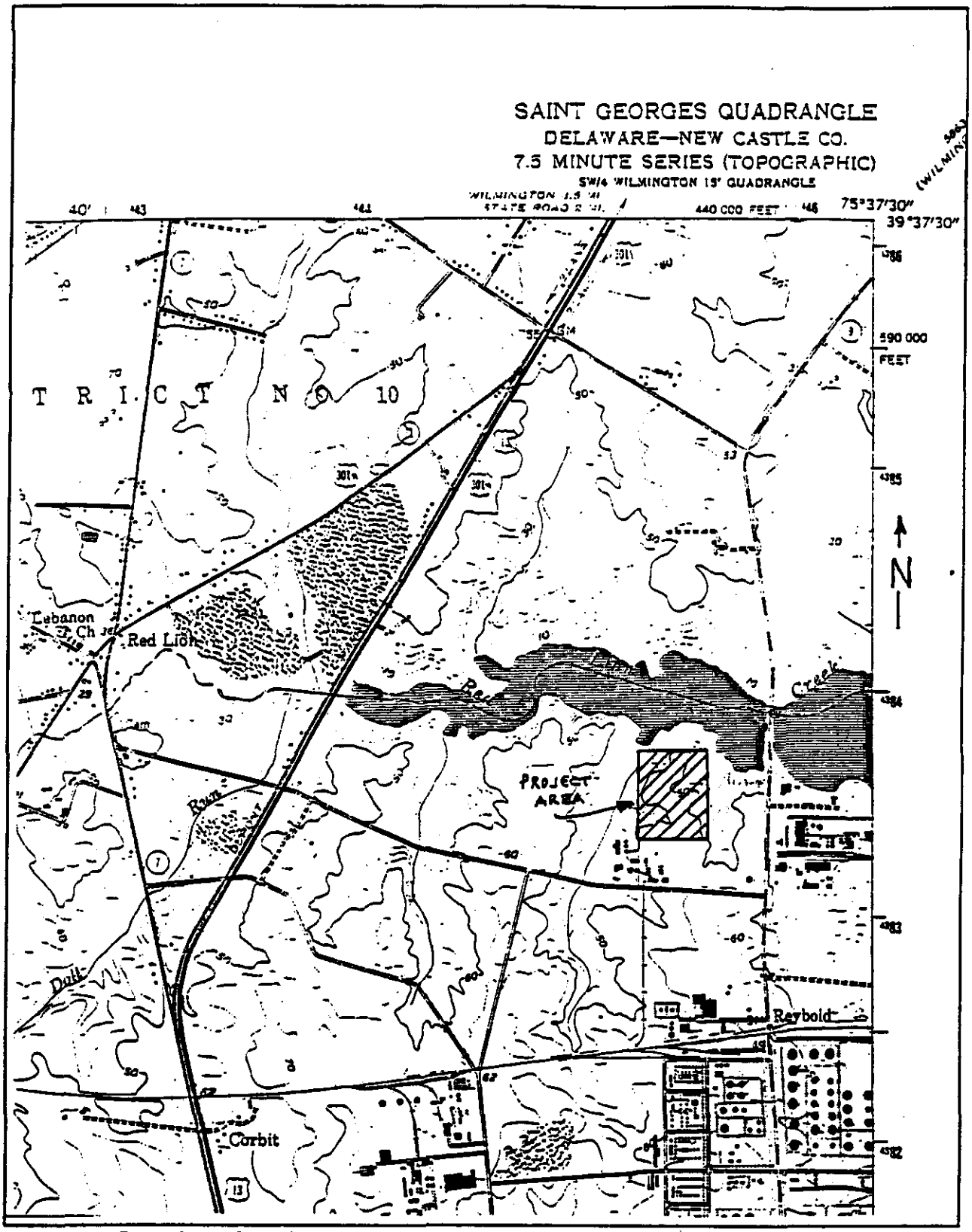

Figure 1. Location of Project Area.

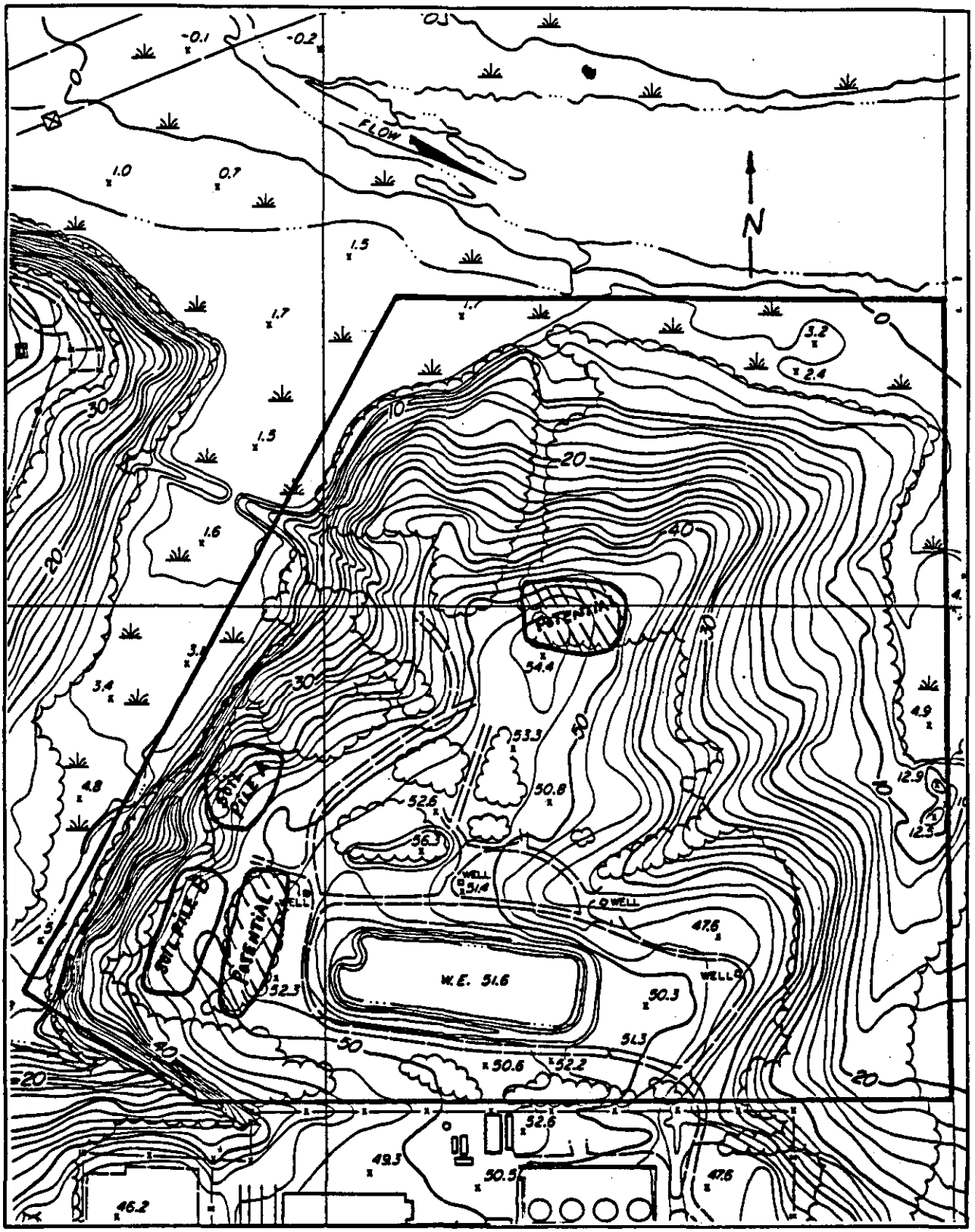

Figure 2. Topographic Map of Project Area.

5.0 Existing Sources of Information

5.1 Culture History

5.1.1 Prehistory

The discussion of the prehistoric background that follows is based primarily on the information in *A Management Plan for Delaware's Prehistoric Cultural Resources* (Custer 1986), but includes data from other sources as appropriate. The presentation of prehistoric background information is used to create a context for developing models of site location during each time period (property type prediction) and as a basis for evaluating their significance. The treatment of each time period includes identifying the settlement patterns utilized and, especially, the settlement patterns that would be likely to be found in the project area.

5.1.1.1 Paleo-Indian Period (ca. 10,000 - 6500 B.C.)

The Paleo-Indian period begins in North America with the arrival of humans from Asia across the ice-age continent of Beringia at least 12,000 years ago and ends with the development of relatively modern environments of the Holocene about 8500 years ago. The Paleo-Indian phase is not particularly well-represented archeologically in the eastern United States or in Delaware, although evidence from the region suggests that humans have lived here for at least the last 12,000 years (Custer 1984:39-60; Custer 1986:31-57).

In the west, the most widespread Paleo-Indian complex is the Llano or Clovis, typified by fluted points, scrapers, and blades. These artifacts are often found in association with extinct Pleistocene megafauna, suggesting an economy centered on big game hunting. In the east, finds showing evidence of Paleo-Indians are usually isolated fluted points, with other evidence suggesting that the Paleo-Indians here had a much more diversified subsistence strategy.

On the Delmarva Peninsula, four phases of Paleo-Indian occupation are recognized by Custer (1986:33-34): Clovis, Mid-Paleo, Dalton-Hardaway, and Notched Point. The starting and ending dates of the four phases have not been established absolutely; they are defined stratigraphically and on the basis of varying artifact types and methods of stone tool production (from William Gardner's work in Virginia). In Delaware, all Paleo-Indian sites are surface finds and information on associated artifacts is scanty.

Custer's analysis of the Paleo-Indian data from Delaware, Maryland, and Virginia allows him to suggest two general settlement patterns for this period: the quarry pattern and the non-quarry pattern. Paleo-Indian sites located near sources of stone tool lithic material are predicted to fall into the quarry pattern, which includes the following site type categories: base camp maintenance station, quarry site, quarry reduction site, quarry-related base camp, and hunting

site. Away from stone sources, the non-quarry pattern includes a more limited range of site types: macro-band base camp, base camp maintenance station, and hunting site.

From a locational standpoint, all types of sites related to quarrying activities are expected to occur in more or less proximity to stone sources. Base camps are usually located close to water in areas of southern exposure and in areas of maximum habitat overlap. Base camp maintenance stations are resource procurement sites found near very rich gathering or hunting locations within 10 to 15 kilometers of base camps. Hunting sites are generally located within 40 kilometers of base camps and are situated at junctions of large and small stream terraces and near bogs, swamps, and other poorly drained areas.

Based on these settlement patterns, three Paleo-Indian spatial study units are defined for Delaware. The first corresponds to the quarry pattern and is found in northern Delaware in association with local chalcedony outcrops. The second corresponds to the non-quarry pattern and is associated with the concentration of Paleo-Indian finds in the Mid-Peninsular Drainage Divide between Delaware and Maryland. The third area corresponds to the remainder of the state, in which Paleo-Indian sites are almost unknown.

The project area falls within Custer's third Paleo-Indian spatial study unit, which lacks large lithic resources and concentrations of areas that are game attractive and which might, therefore, be expected to lack Paleo-Indian sites. However, as Custer points out (1986:52-57), there is as yet no evidence either for or against the existence of Paleo-Indian sites in this spatial unit. Additionally, the poorly-understood effect of post-Pleistocene sea level rise complicates understanding site distributions and settlement patterns along the shore of Delaware Bay.

Based on Custer's settlement pattern divisions, the site area falls into the non-quarry pattern. Within that pattern, given the location of the project area adjoining a large, swampy stream estuary, we might expect that any Paleo-Indian sites found would be within the hunting site property type.

5.1.1.2 Archaic Period (ca. 6500 - 3000 B.C.)

The end of the Pleistocene saw many environmental changes, including the inundation of some riverine environments, a change from mixed coniferous forests to northern hardwoods, and the transition to a more temperate climate. The Archaic period is one of cultural readaptation to these changes. In general, the Archaic is characterized by regional specialization and the concomitant elaboration of tool kits, an increasing population, and increasing sedentism (Custer 1984:61-74; 1986:58-83).

The Archaic period is usually divided into three sub-periods: Early, Middle, and Late. Traditionally, the Early Archaic dates approximately 8000-6500 B.C., overlapping the end of the Paleo-Indian period. The Middle Archaic begins with the warming and drying trend of the Altithermal which began 6500 - 5000 B.C. and lasted for approximately 2000 years. Rainfall decreased and the rivers slowed; the sluggish waters made freshwater mussels available for the

first time, encouraging riverine settlement. The Middle Archaic climate was warmer and drier than the climate today. By about 3000 B.C., the environment became essentially modern. What is usually termed the Late Archaic (circa 3000 - 1000 B.C.) is much better known from the archeological record than the earlier phases of the period. Sedentism had increased with the increased use of aquatic resources. Ground stone tools and the atlatl were common; steatite vessels and fiber-tempered pottery were in use by around 2000 B.C.

In Delaware, Custer includes the Early Archaic sub-period with the previous Paleo-Indian period. He also includes the Late Archaic sub-period with his later Woodland I period. Unfortunately, few Archaic sites are known, and no intact Archaic sites have yet been excavated in Delaware. In general, however, Archaic sites are located in a wider variety of environmental settings and in different locations than earlier Paleo-Indian sites. Archaic populations possessed a diffuse adaptation to increased environmental variety and resources (Custer 1986:65).

Based on work at Archaic sites in other areas of the Middle Atlantic region, Custer defines the Archaic settlement pattern as consisting of three types of sites: macro-band base camp, micro-band base camp, and procurement site (Custer 1986:66-67). Base camps are located in areas of maximum habitat overlap. The locations of procurement sites are variable and depend upon the resources being procured.

The Archaic settlement pattern is projected to occur in five major spatial units within Delaware: the Piedmont Uplands, major drainages, freshwater swamps, the Mid-Peninsular Drainage Divide, and the remainder of the state (about which very little is known).

Although the project area falls within Custer's major drainages spatial study unit, there are no large river drainages close at hand, and so it is not likely that sites in this area would be either macro- or micro-band base camps (both of which occur in major drainage areas). Thus, the most probable property type in the project area would be the Archaic procurement site.

5.1.1.3 Woodland Period (ca. 3000 B.C. - A.D. 1600)

The Woodland period marks increasingly complex and varied lifeways (Custer 1984:75-171; Custer 1986:84-161). Archeologically-visible expressions of these changes include the widespread use of pottery, burial mounds, increased elaboration of mortuary ceremonialism, and long-distance trade. This period also witnessed the cultivation of both native and tropical plants and reliance on storage of foodstuffs. The transition from the Archaic to Woodland periods also is marked by the appearance of woodworking tools, such as axes and celts, and ceramics with fabric impressions and carved-paddle stamping. Both types of artifacts reflect a more sedentary lifeway than was found during the Archaic. The bow and arrow also came into use at this time.

In Delaware, Custer divides the Woodland period into Woodland I (3000 B.C. - 1000 A.D.; traditionally, Late Archaic through Middle Woodland) and Woodland II (1000 A.D. - 1600 A.D.; traditionally, Late Woodland) periods. The Woodland I data base makes up the largest component of Delaware's prehistoric archeological record. In the Upper or High Coastal

Plain physiographic zone of northern Delaware in which the project area is located, complexes identified for Woodland I include Barker's Landing, Delmarva Adena, Carey, and Webb. In the same region, the only Woodland II complex noted is the Minguannan. The end of the Woodland period, the seventeenth century, marks the beginning of European contact in the state.

Custer defines the Woodland I settlement pattern as consisting of three types of sites: macro-band base camp, micro-band base camp, and procurement site (Custer 1986:104-106). In many ways, the structure of the Woodland I settlement pattern is similar to that of the earlier Archaic, although locations change dramatically. Base camps are located in areas where surface water is most reliable and where hunted and gathered resources have high productivity. The locations of procurement sites are variable and depend upon the resources being procured.

The Woodland I settlement pattern is projected to occur in a variety of spatial study units within Delaware, including the Piedmont Uplands, major drainages, Fall Line Zone, interior swamp/marsh, Mid-Drainage Zone, and the Coastal Zone. Custer's map of spatial study units (1986:132) shows the project area within the Delaware River Shore Zone (although the map does not correspond exactly with his accompanying text discussion). It appears that the Woodland I procurement site property type has the highest probability of being found in the project area during this time period, because the area surrounding the project site does not seem to possess a concentration of productive food resources necessary for base camp occupations.

The beginning of the Woodland II period is marked by the appearance of agricultural food production in varying degrees in different parts of Delaware, with concomitant changes in settlement patterns and site types in some areas of the state. In northern Delaware, however, the settlement patterns of the Minguannan Complex seem to be very similar to the preceding Woodland I period, with settlement focused on areas of predictable and reliable surface water resources (Custer 1986:142). Therefore, as was the case for Woodland I, the Woodland II procurement site appears to be the property type with the highest probability of being found in the project area during this time period.

5.1.2 Historic Period Development

The land along the Delaware River in northern Delaware was visited by Europeans on a fairly regular basis beginning with the settlement of New Castle by Swedish colonists in 1638. Initial settlement was made at that location; the outlying area was settled during the rest of the century. Prior to permanent settlement, the numerous streams were explored and exploited by the colonists. The early pattern of settlement was to clear the land and build some form of temporary shelter. These impermanent buildings and structures have not survived the centuries.

The oldest surviving dwelling in the area, built in 1704, is located between Port Penn and the present Chesapeake and Delaware Canal. Known as the Ashton House, this two-story brick building represents an early attempt by the rural elite of Delaware to construct permanent dwellings. Additional early eighteenth-century dwellings are rare in this area, known as the Red Lion Hundred, but this is a typical pattern in the entire state. (A Hundred is an archaic term

that refers to administrative areas in Delaware. Similar to a township in geographic terms, the Hundred has no governing unit, but was used as a taxing or voting location. It is now used only in historic studies and in land records).

Numbers of surviving dwellings do not remain from the seventeenth and the first six decades of the eighteenth centuries in this area or in the entire state of Delaware. These 160 years represent a period of exploration and settlement (1630-1730) of the region (Ames *et al* 1989:21). This led directly to an intensive use of the land that resulted in durable occupation (1730-1770) (Ames *et al* 1989:21). The fact that brick buildings were being constructed early in the occupation of this rural landscape indicates the speed with which European settlement spread out from the town of New Castle and along the Delaware River shore line.

The last few decades of the eighteenth century and the nineteenth century saw a period of increased prosperity in Red Lion Hundred that is reflected in the surviving architecture. Across the State of Delaware, during this period (1770-1830), increased attention was given to the industrial use of the land and its resources (Ames *et al* 1989:21). Water-powered mills were established along many of Delaware's waterways to exploit these resources and to process the grains and timber for sale in the mid-Atlantic region.

This process of industrialization had a profound effect on the agricultural sector of Delaware. As population increased and became concentrated in the more urban northern portion of the state, the Delaware farmer was able to increase his output and his prosperity by raising food for the new industrial labor force. This prosperity is directly reflected in the built environment of the region.

The area was agricultural in economic activity, with only the town of St. Georges providing a rural center of population until the construction of the Chesapeake and Delaware Canal in 1828. Delaware City, at the eastern terminus of the canal, was established to serve the individuals and boat crews traveling through the canal. The canal was a non-stop passageway across the Delmarva Peninsula from the Delaware River to the Chesapeake Bay. The intent of the canal was to offer a safe, protected, and shorter route between Philadelphia and Baltimore. While the canal construction did not have an immediate effect on the architecture and history of the Red Lion Hundred area, it did reveal large quantities of marl, a natural fertilizer. Its use transformed the agriculture of the region and made the eastern half of Red Lion Hundred increasingly important as an agricultural center for northern Delaware.

Rural agricultural prosperity continued to increase in the 1830-1880 period (Ames *et al* 1989:21). Industrialization continued; as the urbanization of northern Delaware and the other American East Coast cities continued to grow in population, demand for the agricultural produce of Red Lion Hundred increased. Delaware produce flowed directly to such urban markets as Baltimore, Norfolk, Philadelphia, and New York. From these ports a significant quantity of Delaware crops were transhipped across the country. The canning plants that were established

in the nearby towns of the region helped spread the market for normally perishable crops. The canning plant became increasingly important after the end of the Civil War. There were no known canning plants in this portion of Red Lion Hundred.

Part of this new agricultural prosperity was brought about by the interest in peach growing for the developing urban markets along the east coast of the United States. The short-term boom in agricultural prosperity encouraged the planting of tens of thousands of peach trees and allowed the local elite to upgrade their housing stock. Much of the architecture of Delaware City and of Port Penn can be traced to rural planters moving into those population centers. Although the peach boom was short-lived, the farmers of the region were able to quickly shift their crops to the more traditional grains and truck farming that characterize mid-Atlantic agriculture in the nineteenth and early twentieth centuries and thus maintain their lifestyle.

After 1880, this region of Delaware continued to specialize in truck farming for the urban market (Ames *et al* 1989:21). Industrialization of the local area did not occur until after the end of World War II. The increased demand for open space for new factories to serve the post-war boom made this agricultural region especially attractive to industrial operations. This and the spread of housing developments throughout the region south of Wilmington, Delaware, altered the historic landscape of this long-standing agricultural area.

5.2 Previously-Recorded Cultural Resources in Surrounding Area

5.2.1 Prehistoric Sites

Prehistoric sites on record in the files of the Delaware State Historic Preservation Office that are located within about 1 1/2 miles of the project area are listed in Table 1 and their approximate locations are shown in Figure 3. None of these sites is currently listed on the National Register of Historic Places (NRHP). In those instances where cultural affiliations can be ascribed to sites, most appear to be mixed multicomponent Archaic and Woodland period occupations consisting of small numbers of lithic tools and some ceramics. The remainder are almost all small, undiagnostic lithic scatters of uncertain age. Delaware State Archeologist Faye Stocum reported finding flakes and fire-cracked rock upslope from Soil Piles A and B (7NC-E-106) on the project site itself during a prior visit to the area.

Based upon the previous review of prehistoric cultural chronology and settlement patterns, the property type most likely to be found in the project area during all time periods was identified as the short-term resource procurement site. Although the sites listed in Table 1 have not been intensively investigated and the data from them may be uneven and/or not representative, for the most part, these small-scale occurrences are consistent with such an identification. Small quantities of cultural material, low diversity of artifact types, and the lack of diagnostic tools are characteristics that are compatible with interpretations of hunting or procurement site property types. In addition, none of the known sites appears to be Paleo-Indian; a low probability of sites from this period is predicted within the physiographic zone in which the study area is located.

Table 1. Prehistoric Sites Near Project Area.

Delaware Archeological Site No.	Delaware Cultural Resource Survey No.	Site Type	Cultural Affiliation/Age
7NC-E-10	N-3774	lithic surface scatter	Archaic/Woodland
7NC-E-11	N-3772	lithic surface scatter	Archaic/Woodland
7NC-E-13	N-3776	lithic surface scatter	Archaic/Woodland
7NC-E-28	N-3770	lithic scatter	prehistoric
7NC-E-29	N-3771	lithic scatter	prehistoric
7NC-E-30	N-3773	lithic scatter	prehistoric
7NC-E-33	N-3775	lithic surface scatter	Woodland
7NC-E-97	N-12,123	lithic scatter	prehistoric
7NC-E-106	N-12,808	lithic scatter	prehistoric

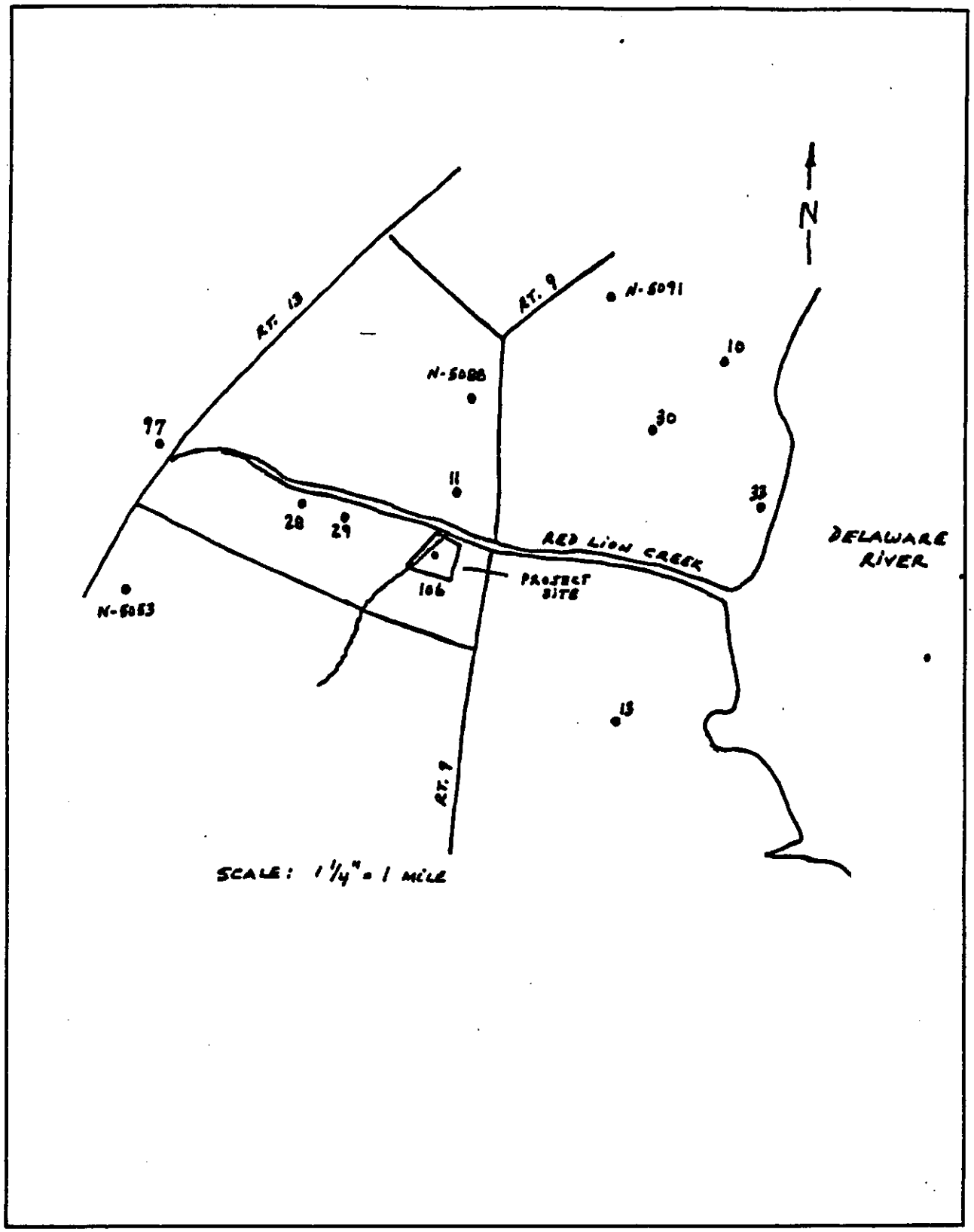

Figure 3. Previously Reported Prehistoric Sites.

5.2.2 Above-Ground Resources

Above-Ground Resources on record in the files of the Delaware State Historic Preservation Office (SHPO) that are located within about 1 1/2 miles of the project area are listed in Table 2. One of these buildings is listed on the National Register of Historic Places.

Not much specific information is available concerning these historic period properties. Building #N-5088 first appears on Rea and Price's 1849 historic map as the estate of G.Z. Tybout. This same building is later plotted on the 1868 Beers' *Atlas of the State of Delaware* as "Bellevue", belonging to the same G.Z. Tybout. It also appears on the Hopkins 1881 map of New Castle County and on Baist's 1893 map. "Bellevue" is listed on the National Register of Historic Places (NRHP). #N-5091 may be the house originally owned by J. Barnaby (Rea and Price 1849; Beers 1868; Hopkins 1881), later the property of one Miss Howlin (Baist 1893).

Rea and Price (1849), Beers (1868), Hopkins (1881), and Baist (1893) also show a number of other historic properties near the project area, although these do not have corresponding listings in the Delaware SHPO files and are not located within the project area. "Willow Brook", the A.E. Davidson house, located on the western side of Route 9 just south of the project area, is closest to the project area (Beers 1868). Its lands may have included the project area. It was later called "The Hill Farm", owned by W.W. Winter (Hopkins 1881; Baist 1893).

One form of architecture that has not survived in the area includes the tenant dwellings and the agricultural buildings that characterized the landscape for much of the period under review. The Beers' (1868) *Atlas* shows numerous buildings in the area, but a review of current site files shows that most of those buildings have not survived to the present day. What does survive are isolated farmsteads and non-agricultural dwellings and the industrial landscape that came to the area above Delaware City in the mid-twentieth century.

Given the long historic occupation of the landscape in this part of Delaware, it would be expected that resources could be located that date as far in the historic past as the seventeenth century. However, those early buildings were mostly impermanent and they have not survived except as archeological sites. What does survive in this region of Delaware are mostly nineteenth and twentieth-century buildings. The range of buildings is limited by the traditionally agricultural use of this area.

Accordingly, the expected property types that might be found in this area are domestic and agricultural buildings. Because of the long standing use of the land, the property types in both categories would be extensive and would include all forms of agricultural and domestic buildings. In addition, given the proximity of the project area to the Delaware River, it is possible that some property types might exist within the fishing and oystering categories. If any such resources do exist within the project area, they will tend to be the remains of smaller buildings and structures associated with small scale harvesting and processing of maritime resources.

Table 2. Historic Sites Near Project Area.

Historic Resource	Delaware Cultural Resource Survey No.	Age	Comments
frame house	N-5053	unknown	
brick house	N-5088	19th century	"Bellevue" (Beers' *Atlas* 1868). Listed on NRHP.
stone house	N-5091	1917	

6.0 Field Work

On November 5th and 6th, 1992, Dr. Christopher L. Nagle and Nathan Knoche of Dames & Moore carried out field work at the project site. David Bredbenner of Standard Chlorine conducted a safety lecture and orientation for the crew. Following the safety lecture, he took readings for organic vapors around the project site using a calibrated flame ionization detector. Since the readings were typical of background levels, work was conducted in Level D protection. All field work was carried out in full compliance with Standard Chlorine's site safety rules and regulations. On November 5, the weather was light rain with a 3-4 mph wind; on November 6, it was clear with a 5-10 mph wind. SCD requested that no photographs be taken within the project area.

6.1 Vegetation History

Nearly the entire area is vegetated, with the exception of the ground surrounding the Soil Piles accumulated during the 1986 response and cleanup, the sedimentation basin, and the gravel roads constructed and maintained to give access to groundwater monitoring wells. Three stages of vegetation growth were identified from the reconnaissance:

1. mature forest (trees 30-50 cm in diameter) occurs along the edge of the west-facing lip of the terrace above Soil Piles A and B, again about halfway down the western slope of the project site below the Soil Piles, and on the north-facing slope of the project site, north of where the containment dike was constructed across the unnamed tributary, and facing Red Lion Creek.

2. revegetation on top of the terrace in the project site that is perhaps 10-15 years old (trees 10-15 cm in diameter). According to Paul Johnston, Environmental Manager for SCD, the plant was built in 1965 on land previously farmed. The level areas north of the plant itself may have still been farmed for several years after the plant was built. These are the limited areas of vegetation on top of the terrace north of the plant site indicated on the project site topographic map (Figure 2). They are quite minor in extent.

3. revegetation probably postdating the 1986 spill and cleanup, consisting of young brush, saplings, honeysuckle, and brambles covering the remainder of the hilltop and adjoining monitoring well access roads. The predominance of this vegetation pattern on top of the hill suggests that much of the top of the hill may have been largely cleared of growth during and after the 1986 cleanup efforts. The descriptions of the 1986 cleanup construction and excavation activities in Weston's report (1988), together with their photographs of the project site in that report, are ample evidence of extensive ground disturbance throughout the project site at that

time. We found many small mounds of dirt scattered around the top of the hill, as well, which may be places where dirt and vegetation was pushed by bulldozers clearing the land and constructing monitoring well access roads during and after the 1986 cleanup efforts.

6.2 Areas of Potentially Undisturbed Soils

The humus soils found on the project site are light brown and generally less than 10 cm deep, grading into yellowish-brown sandy gravels.

The areas where the Soil Piles are located on the western slope of the project site were completely scraped and cleared of vegetation by bulldozers during the 1986 response and cleanup (Figure 2). Tree trunks and vegetation were pushed up the hill on the western slope to rest in and around the mature trees located at the western lip of the terrace. There appears to be no ground left undisturbed above (east of) Soil Pile A; the remnant of mature forest is very narrow there due to vegetation clearance and the close proximity of one of the well monitoring access roads. However, an area of approximately 100 to 200 feet by 50 feet above (east of) Soil Pile B, lying within the remnant of mature forest at the lip of the terrace, may be relatively undisturbed.

Based upon vegetation patterns only (as no Phase I(B) subsurface testing was conducted), the only other place in the project site that may remain undisturbed is the far northern edge of the terrace overlooking Red Lion Creek. In this area, the vegetation is transitional between type 2 identified above and the mature forest (type 1, above) on the north-facing slope. Further, it is level and relatively distant from the plant and the 1986 cleanup operations. Both this location and that above Soil Pile B are identified on Figure 2 as possibly undisturbed areas which have the highest potential of containing buried archeological resources within the boundaries of the project site.

6.3 Archeological Field Methods

Archeological field work consisted of a walkover and visual inspection of the entire twenty-five acre project site. Efforts were concentrated on the level portions or on moderate slopes, where the walkover was conducted at intervals of about 10 meters. At the time of the survey, leaves had fallen, mantling the ground. In order to carry out the inspection, trowels and trenching shovels were used to clear leaf litter and, occasionally, to remove topsoil. In addition, all exposed ground surfaces were checked and the columns of soil left around standing mature trees above the Soil Piles on the western lip of the terrace were intensively inspected, since this is where it was reported that flakes and fire-cracked rock were found previously.

7.0 Inventory of Cultural Resources

Only one artifact was found, lying on the surface of the ground three meters upslope from Soil Pile A. It is a small sherd of historic pottery, 1 x 2 cm in size and 4 mm thick. The body of the sherd is dark grey to brown in color, and one face has a lustrous black glaze. It is badly eroded on the face opposite the glazing. The sherd has been identified as redware, a refined earthenware made in England from circa A.D. 1751—1818, with its peak production falling between A.D. 1751 and 1790 (Lynn Jones, pers. comm.). Redware possesses a fine-grained body, purplish to grayish in color, with usually a clear glaze. A variant with a glossy black glaze is called Jackfield ware. No cultural features or evidence of buildings or structures were located in association with the potsherd. Future subsurface testing upslope from this find may reveal buried historic materials that may be associated with it. The expected property types are domestic and agricultural buildings or, possibly, those deriving from fishing or oystering activities.

It was not possible to relocate the flakes and fire-cracked rock reported from along the western lip of the terrace above the Soil Piles, although all leaf litter was mechanically cleared from around the bases of trees and the area was searched extensively for the artifacts left behind at the site; no other similar materials were found during the reconnaissance.

8.0 Summary

The level aspect of roughly half of the project site, coupled with the proximity of Red Lion Creek and its marsh resources, suggests that the study area would have been attractive for past human occupation, both by prehistoric and historic populations. The review of existing sources of data generated the expectations that Paleo-Indian sites have only a moderately low probability of occurring in the physiographic zone in which the project area is located, but that Archaic and Woodland I and II procurement site property types can be expected. The fact that several Archaic and Woodland period prehistoric archeological sites are known from the immediate vicinity, together with evidence from the historical record of continuous occupation since the seventeenth century, confirms the potential of the region for prehistoric and historic resources.

On the basis of the Phase I(A) survey, most of the level ground in the project area appears to have been badly disturbed in the past. Much of the disturbance may have taken place as a result of the response and cleanup efforts by the Weston Corporation in 1986, although earlier clearing and farming of the site no doubt has played a role as well. No cultural features or evidence of past structures were located during our survey. Only one historic period artifact was found, lying on the surface of the ground upslope from Soil Pile A.

Two small areas on the level portions of the project site were identified which have the highest probability of having remained undisturbed: (1) a roughly rectangular area of about 100 to 200 by 50 feet at the crest of the slope above Soil Pile B, where standing mature trees suggest

a lack of ground disturbance; and (2) the far northern edge of the level portion of the project area, farthest from the plant, by virtue of its distance from the plant and the loci of the 1986 cleanup operations.

9.0 Recommendations

Based on conversations with the Delaware State Historic Preservation Office, Dames & Moore recommends that further Phase I(B) archeological testing be conducted on the project site to verify the Phase I(A) findings and to assess the extent and degree of ground disturbance throughout the entire study area.

Phase I(B) survey is suggested for two reasons. First, the Phase I(A) field work occurred in November when leaf litter hampered visual observations. It thus seems prudent to supplement these inspections with subsurface testing.

Second, because an archeological site (7NC-E-106) was previously reported from the project area which was not relocated during field work, subsurface testing should be undertaken to attempt to explore whether or not intact archeological deposits associated with this site are present. Site 7NC-E-106 has probably been disturbed by past remedial actions; Phase I(B) testing will help determine how much of it may still exist. Phase I(B) testing will also establish how much of the topsoil/plow zone and B-horizon has been removed. Intact features may yet be found beneath the truncated soil horizons.

SCD is examining a number of alternatives to clean up the project area, but it is not yet known which of these will be employed. Generally, the alternatives being considered entail different processes for cleanup; all of the options under consideration are potentially ground disturbing. In order to ensure that all potentially impacted resources are identified, evaluated, and considered in accordance with 36 CFR 800, regardless of the clean-up option selected, it is recommended that:

--Intensive Phase I(B) be conducted over the entire twenty-five acres subject to potential impact, and include shovel testing to identify subsurface remains;

--All prehistoric and historic resources be identified, evaluated, and flagged for avoidance, wherever possible;

--All resources identified be recommended for no further work, Phase II evaluation, mitigation, or avoidance, as appropriate;

--Any later cleanup activities that may occur outside of the inventoried twenty-five acres must be preceded by similar intensive cultural resource inventory to ensure that all sites are identified, evaluated, and considered.

9.0 References

Ames, David L., Mary Helen Callahan, Bernard L. Herman, and Rebecca J. Siders. *Delaware Comprehensive Historic Preservation Plan.* Center for Historic Architecture and Engineering, Newark, Delaware. 1989.

Baist, G. William. *Atlas of New Castle County, Delaware.* G. William Baist, Publisher, Philadelphia, PA., 1893.

Beers, D.G. *Atlas of the State of Delaware.* Pomeroy and Beers, Philadelphia, PA. 1868

Custer, Jay F. *Delaware Prehistoric Archaeology: A Ecological Approach.* University of Delaware Press, Newark, Delaware. 1984.

Custer, Jay F. *A Management Plan for Delaware's Prehistoric Cultural Resources.* University of Delaware Center for Archaeological Research, Monograph No. 2, Newark, Delaware. 1986.

Herman, Bernard L. *Architecture and Rural Life in Central Delaware, 1700-1900.* University of Tennessee Press, Knoxville, Tennessee. 1987.

Hopkins, G. M. *Map of New Castle County, Delaware.* G.M. Hopkins & Co, Philadelphia, PA. 1881.

Rea, Samuel and Jacob Price. *Map of New Castle County, Delaware.* Smith & Wistar, Philadelphia, PA. 1849.

Scharf, J. Thomas. *History of Delaware 1609-1888*, 2 volumes. L.J. Richards and Co., Philadelphia, PA. 1888.

Weston, Roy F., Inc. *Report on Response and Cleanup Efforts of a 5 January 1986 Chlorobenzene Spill.* Report courtesy of Standard Chlorine, Inc. 1988.

Appendix 1

Technical Proposal

and

Scope of Work

DAMES & MOORE
7101 WISCONSIN AVENUE, SUITE 700, BETHESDA, MARYLAND 20814-4870
(301) 652-2215 FAX: (301) 656-8059

September 23, 1992

Standard Chlorine of Delaware, Inc.
P.O. Box 319
745 Governor Lea Road
Delaware City, DE 19706
ATTN: Mr. Dave Parker - Purchasing

Re: Phase IA Cultural Resource Evaluation Standard Chlorine of Delaware

Dear Mr. Parker,

Dames & Moore is pleased to present this proposal to perform a Phase I(A) Cultural Resource evaluation for a site of approximately twenty-five acres at Standard Chlorine of Delaware, Inc. (SCD) in Delaware City, Delaware. Our visit to the site by Dr. Christopher Nagle has established that it is predominantly wooded, with a topography varying from relatively level north of the plant itself, to steeper slopes to the west.

1.0 OBJECTIVE

The objective of Dames & Moore's Phase I(A) Cultural Resource evaluation will be to assess the presence or absence of potentially significant archeological or historical materials in the project area in conjunction with SCD's ongoing Remedial Investigation/Feasibility Study (RI/FS). If deemed necessary based on the findings of the Phase I(A) evaluation, a Phase I(B) Field Investigation of the project area will be recommended.

2.0 SCOPE OF SERVICES

Dames & Moore proposes to accomplish the objectives summarized in Section 1.0 by conducting the following tasks. The tasks will be performed by Dr. Christopher Nagle, Project Archeologist, and Nathan G. Knoche, Field Technician. Health and Safety Certificates are attached for each.

Phase I(A)

Task 1 - Site files and literature search

Dames & Moore will perform a comprehensive document search to identify any known or potential historical, architectural, and/or archeological resources within the study area. This task includes checking the project area against current site files for recorded sites and against historic maps for known sites. The occurrence of previous surveys for cultural resources will be noted. Information on any known or projected resources will be recorded. Delaware State Historic Preservation Office (SHPO) staff will be consulted about the probability of sites in the project area. This task will also include an evaluation of the differential sensitivity of the area for the presence of cultural resources. Evaluation is based on data such as topography, distance to water source and other determinants of prehistoric and historic occupation. The relevant aspects of the RI/FS project will be evaluated to determine the impact of remediation efforts on potential cultural resources.

Task 2 - Walkover survey and intensive visual inspection

In this task Dames & Moore will conduct a one-time site inspection. This site visit will entail a walkover survey in parallel transects. Some trowel testing may be performed to improve surface visibility and some testing with hand augers to evaluate site stratigraphy may also be conducted. The purpose of this walkover will be to visually inspect the property to locate visible archeological features, artifacts, and standing structures, to identify areas that are severely disturbed and to locate areas with a high probability of containing significant cultural resources.

Task 3 - Report Preparation for Phase I(A)

In this task Dames & Moore will evaluate the information collected in preceding tasks and present it in a report on Phase I(A) work. The report will focus on the project area and will include: a project description, a description of the environmental setting as it pertains to actual or potential cultural resource locations; and a synthesis of prehistoric and historic cultural development and land use patterns. The report will include information about identified sites in the project area, as well as within a mile and a half radius. This information will include all properties that are eligible, listed, or being considered for inclusion in the National Register of Historic Places, and any sites recorded by the Delaware SHPO. Areas of substantial land modification within the project area will be identified. Materials which support conclusions presented in the text will be included as appropriate. The Phase I(A) report will contain recommendations for any subsequent Phase I(B) survey work. If, after consultation with the State Historic Preservation Officer, it is determined that no significant

cultural resources exist within the project area, Phase I(B) survey work will not be necessary.

Phase I(B)

Task 4 - Field Investigation

If deemed necessary based upon the findings of the Phase I(A) study, Dames & Moore will conduct a Phase I(B) field investigation of the project area. The areas to be surveyed will be selected on the basis of proposed remedial investigations (RI). Given our understanding of the project area topography (based upon our inspection of the site), previous remediation efforts and ground disturbance, and prehistoric and historic settlement patterns, we believe that 40% of the approximately 25-acre project area will require subsurface testing for cultural resources. At the discretion of the Principal Investigator, shovel tests will be excavated on a grid with spacings at approximately 20 meter intervals. Shovel tests will be excavated by hand to the depth of sterile soil or approximately 60 cm (shovel tests cannot be efficiently excavated below 60 cm, a depth that is usually sufficient to establish the presence of subsurface cultural deposits). The excavated soil will be screened through 1/4" hardware-cloth mesh unless soil conditions preclude screening. Stratigraphy and all cultural materials will be recorded, together with floral and faunal samples as deemed appropriate.

As sites are located, the probable boundaries of each will be determined by further shovel testing at intervals to be determined given the particular sites. As artifacts are collected in the field they will be counted, photographed, and described as fully as possible. Unless there are finds of rare or unusual items, we will not remove artifacts from the site. Our goal is to minimize your potential liability in connection with the transfer and curation of objects possibly contaminated with paradichlorine benzine. The location of identified resources with respect to areas of impact of the proposed project will be determined. Although detailed evaluation of specific resources will not be carried out in Task 4, archeological or historical sites located will be described as fully as possible to aid in the formulation of recommendations for avoidance or further evaluation of their significance as explained below.

Significance will be evaluated according to the criteria for the National Register of Historic Places (NRHP) and for public significance.

The National Register Criteria (36 CFR 60) are as follows :

> The quality of significance in American history, architecture, archeology, and culture is present in districts, sites, buildings, structures, and objects of State

and local importance that possess integrity of location, design, setting, materials, workmanship, feelings and associations, and

(a) That are associated with events that have made a significant contribution to the broad patterns of our history; or

(b) That are associated with the lives of persons significant in our past; or

(c) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

(d) That have yielded, or may be likely to yield, information important in prehistory or history.

Task 5 - Report Preparation for Phase I(B)

In this task Dames & Moore will evaluate and integrate the information gathered in Tasks 1 through 4 and will present the results of the field investigation including: a description of the survey design and methodology (based on results of Phase I(A)); complete records of soil stratigraphy; and an artifact catalogue including identification, estimated date range, and quantity or weight, as appropriate. The locations of all field test units will be accurately plotted on a project area map, with locations of identified resources clearly marked. Photographs which illustrate pertinent points of the survey area will be included in the final Phase I(B) report. Detailed recommendations and supporting rationale for any additional investigation will be incorporated into the conclusions of this report as well.

3.0 HEALTH AND SAFETY REQUIREMENTS

Dames & Moore will comply with the requirements of the Health and Safety Plan which will be administered by an on-site SCD representative. It is understood that this work may be performed in part of a known hazardous materials site and that protective clothing and protective respiratory devices (if needed) will be required. All contract work will be performed wearing modified Level D protection. If air monitoring detects organic vapor levels above background levels in the breathing zone, Dames & Moore will have the ability to upgrade to Level C respiratory protection. Dames & Moore will supply all protective clothing and equipment necessary for its personnel. This equipment will be NIOSH/OSHA approved as appropriate, and in working condition, as specified by the manufacturer. Training certificates and fit-for-duty forms for field personnel are attached to this proposal.

Appendix 2

Resumes of Principal Investigators

CURRICULUM VITAE

CHRISTOPHER L. NAGLE

TITLE Senior Archeologist

EXPERTISE Prehistoric Archeology
Quantitative Methods/Statistical Analysis
Geographic Information Systems

EXPERIENCE WITH FIRM

Senior Archeologist, 1992-Present

- Responsible for developing proposals, research designs, and cost estimates, acting as Principal Investigator for archeological field projects, including directing surveys and excavations, laboratory analysis and reports.

OTHER EXPERIENCE

Adjunct Assistant Professor, Department of Anthropology, University of Maryland, College Park, Maryland, 1992-present

- Teach two graduate and undergraduate courses/year: statistical and quantitative methods; qualitative (text) database management/analysis and mapping.

Senior Statistical Consultant, College of Behavioral and Social Sciences, University of Maryland, College Park, Maryland, 1991-1992

- Provide support to faculty members and graduate students for research design, data analysis, and interpretation using SAS, SPSS, SYSTAT, and other statistical analysis programs. Supervise 18 students who provide assistance to students using the five College microcomputer laboratories.

Research Archeologist, Department of Anthropology, Smithsonian Institution, Washington, DC, 1988-present

- Under contract to complete analyses and produce manuscripts for Labrador (Canada) Torngat Project monograph series on 1) Late Dorset Palaeo-Eskimo site excavations and artifact assembiages; 2) neutron activation studies of Maritime Archaic Indian soapstone materials; and 3) Maritime Archaic exotic lithic remains.

- Completing manuscript changes to Ph.D. dissertation for publication by Smithsonian Institution Press (Peer-reviewed and accepted for publication pending manuscript changes).

Research Associate, Department of Anthropology, Smithsonian Institution, Washington, DC, 1984-present

- Continuing archeometric lithic raw materials resource studies on cherts, soapstones, and nephrite jades from the Eastern Canadian Arctic. Research program is directed toward (1) developing a systematic

understanding of Palaeo-Eskimo raw materials utilization and cultural interaction throughout the region across space and through time; and (2) demonstrating the relevance of study area results to more general theories of resource procurement and exchange in hunter/gatherer societies.

Computer Specialist, various positions, 1985-1991

- Various positions focusing on computer user support, systems analysis, programming, and statistical analysis with the Smithsonian Institution, Catholic University, Federal Aviation Administration, and the University of Maryland.

Postdoctoral Fellow in Materials Analysis, Conservation Analytical Laboratory, Smithsonian Institution, Washington, DC, 1983-1984

- Physical and chemical characterization of nephrite jades from the Eastern Canadian Arctic, employing petrographic thin-sections, x-ray diffraction, electron microprobe, and instrumental neutron activation analytical techniques, to assist in elucidating regional patterns of raw materials procurement and exchange in Palaeo-Eskimo cultures.

Dissertation Research, Brandeis University, Waltham, Massachusetts, 1980-1983

- Research on the procurement and distribution of various kinds of lithic material (cherts, soapstone, jade, and schist) from Dorset Palaeo-Eskimo sites along the Labrador coast. Data for each type of material, controlled by stage of manufacture and site function, were evaluated against a distance-decay model, developed from ethnographic evidence of raw materials acquisition in hunting and gathering societies.

Flintknapping Fieldschool, Washington State University, Pullman, Washington, 1981

Research Co-Director and Computer Applications Specialist, Torngat Archeological Project, Smithsonian Institution and Bryn Mawr College, 1977-1980

- Responsible for analysis, description, and publication of Late Palaeo-Eskimo sites and cultural materials from northern Labrador. Directed lithic sampling program and neutron activation studies of nephrite jades and soapstones. Planned and directed computerized information management and statistical analysis of 1977 and 1978 archeological collections.

Museum Technician, Department of Anthropology, Smithsonian Institution, Washington, DC, 1976

- Directed a pilot feasibility study for computerization and inventory of all specimen holdings in archeology and ethnology, using Smithsonian's SELGEM information management system. Designed comprehensive

system, including data categories to be recorded, record formats, and file structure. Constructed demonstration files and produced sample application reports.

Research Assistant, Department of Anthropology, Smithsonian Institution, Washington, DC, 1975-1977

- Analysis and preparation for publication of archeological materials from Labrador (Canada) Indian and Eskimo sites, directing volunteers in lab projects, and planning for field work.

- In charge of planning, implementing and maintaining computer files of Labrador archeological sites and specimens using Smithsonian's SELGEM information management programs; produced computer-generated catalogs of archeological specimens; performed statistical analyses of specimen data. Designed custom Optical Character Recognition form for in-field data entry procedures.

Research Assistant, Haffenreffer Museum, Brown University, Providence, Rhode Island, 1972-1973

- Participated in the analysis of archeological materials from sites in northwestern Alaska.

ACADEMIC BACKGROUND

Ph.D., Anthropology/Archeology, Brandeis University, Waltham, Massachusetts, 1984
B.A., Anthropology/Archeology, Brown University, Providence, Rhode Island, 1973

PROFESSIONAL AFFILIATIONS

Member, Society for American Archeology
Member, Society for Archeological Sciences
Member, Arctic Institute of North America
Member, Alaska Anthropological Association
Member, Canadian Archeological Association
Member, American Anthropological Association
Member, Council for Museum Anthropology

SPECIALIZED TRAINING

40-Hour OSHA Hazardous Materials Site Worker Course
8-Hour OSHA Supervisor's Training Course
8-Hour CPR/First Aid Training Course

SELECTED PUBLICATIONS

Nagle, C.L. Comment on: "Diversity, Organization, and Behavior in the Material Record: Ethnographic and Archeological Examples" by Michael J. Shott. *Current Anthropology* 30(3):305-306, 1989.

Altschul, J.H. and C.L. Nagle. "Collecting New Data for the Purpose of Model Development." Pp. 257-299 (Chapter 6) in ***Quantifying the Present and Predicting the Past: Theory, Method, and Application of Archeological Predictive Modeling***, edited by W. James Judge and Lynne Sebastian. U.S.

Department of the Interior, Bureau of Land Management Service Center, Denver, 1988.

Nagle, C.L. "Flaked Stone Procurement and Distribution in Dorset Culture Sites Along the Labrador Coast." Pp. 95-110 in ***Palaeo-Eskimo Cultures in Newfoundland, Labrador and Ungava***. Memorial University of Newfoundland Reports in Archeology No. 1, St. John's, Newfoundland, 1986.

Nagle, C.L. "Lithic Raw Materials Resource Studies in Newfoundland and Labrador: A Progress Report." Pp. 86-121 in ***Archeology in Newfoundland and Labrador – 1984***, edited by J.S. Thomson and C. Thomson. Annual Report #5, Historic Resources Division, Government of Newfoundland and Labrador, St. John's, Newfoundland, 1985.

Allen, R.O., H. Hamroush, C.L. Nagle and W. Fitzhugh. "Use of Rare Earth Element Analysis to Study the Utilization and Procurement of Soapstone Along the Labrador Coast." Pp. 3-18 in ***Archeological Chemistry – III***, edited by J.B. Lambert. ACS Advances in Chemistry Series, No. 205, 1984.

Rogers, M., R.O. Allen, C.L. Nagle and W. Fitzhugh. "The Utilization of Rare Earth Element Concentrations for the Characterization of Soapstone Quarries." ***Archeometry*** 25:186-195, 1983.

Blackman, M.J. and C.L. Nagle. "Characterization of Dorset Paleo-Eskimo Nephritic Jade Artifacts from Central Labrador." Pp. 411-419 in ***Proceedings of the 22nd Symposium on Archaeometry (1982)***, edited by A. Aspinall and S.E. Warren. University of Bradford, U.K, 1983.

Nagle, C.L. and U.V. Wilcox. "Optical Mark Recognition Forms in Data Entry: Some Applications." ***Journal of Field Archeology*** 9:538-547, 1982.

Nagle, C.L. "1981 Field Investigations at the Fleur de Lys Soapstone Quarry, Baie Verte, Newfoundland." Pp. 102-129 in ***Archeology in Newfoundland and Labrador – 1981***, edited by J.S. Thomson and C. Thomson. Annual Report #2, Historic Resources Division, Government of Newfoundland and Labrador, St. John's, Newfoundland, 1982.

Nagle, C.L. "Indian Occupations of the Intermediate Period on the Central Labrador Coast: A Preliminary Synthesis." ***Arctic Anthropology*** 15:119-145, 1978.

Nagle, C.L. "Report on Meeting for Computer Data Banking in Anthropology Museums." ***Newsletter of Computer Archeology*** 12:40-44, 1976.

CURRICULUM VITAE

STEPHEN G. DEL SORDO

TITLE Senior Architectural Historian

EXPERTISE
Historic Preservation
Anthropology
Ethno-History
American History

EXPERIENCE WITH FIRM
Senior Architectural Historian, 1992-Present

OTHER EXPERIENCE

Delaware State Historic Preservation, 1982-1992

- Served as a Historian/Administrator for the National Register of Historic Places Program
- Served as Administrator for Historic Site Surveys for Dover, Delaware Preservation Planning, and Certified Local Government Programs.

Self-employed Consultant, 1980 - present

- Served as a consultant with expertise in the areas of Architectural History, Industrial Archeology, and Planning & Zoning.

U.S. National Park Service, Valley Forge, PA, 1977 - 1978

- Assistant Supervisory Park Ranger for visitor services and historical programs.

Pennsylvania Historical Commission, Valley Forge, PA, 1976 - 1977

- Served as an interpreter; visitor services, Museum and Historical programs.

Graduate Teaching Assistant, Department of History, University of Delaware, Newark, DE, 1980-1981.

U.S. History & Economics Teacher, Rose Tree Media School District, Media, PA, 1978-1979.

ACADEMIC BACKGROUND

Ph.D., American Studies, University of Maryland, (in progress)
M.A., American History, University of Delaware, 1981
Graduate Studies, Ethnohistory with A.F.C. Wallace, University of Pennsylvania, 1972

B.A., Anthropology, West Chester University, 1972
Certification in Secondary Education, Social Studies, Immaculata College, 1975

PROFESSIONAL TRAINING

40-Hour Hazardous Materials Site Worker Course
including CPR and First Aid Training

PROFESSIONAL AFFILIATIONS

Member, Dorchester County Committee of 100
Member, Dorchester County Historical Society
Chairman, Dorchester County, Committee for the Maryland Historical Trust
President, Historic Cambridge, Inc.
Member, Organization of American Historians
Member, Society of Architectural Historians
Member, Society for Industrial Archeology
Member, Vernacular Architecture Forum
Member, Vernacular Architecture Group (UK)

SELECTED PUBLICATIONS

"Pennsylvania Barns--A Review Essay," Winterthur Portfolio.

From New Sweden to New Zion: African-American Communities in Delaware". Paper read at the Annual Conference of the Afro-American Historical Society of Delaware

"Delaware's Past Present: Eighteenth Century Delaware in the Twentieth Century", Bicentennial Lecture Series, Delaware Museum of Natural History

"American Log Buildings - a Review Essay," Winterthur Portfolio

"Oysters and Bayshore Towns." paper read at the conference "Man and Bay Together" sponsored by the Lehigh University

To Build in the Best Manner: Vernacular Architecture in Middle Delaware. (Dover, DE: Division of Historical & Cultural Affairs)

"Eighteenth-Century Flour Mills; Some Chester County, PA Examples" Perspectives in Vernacular Architecture (Annapolis, MD: Vernacular Architecture Forum)

Industry in Montgomery County, 1880-1980, (Blue Bell, PA: Montgomery County Industrial Development Corporation)

"White Gold: Some Economic Aspects of the Delaware Oyster Industry, 1870-1930." Paper read at the Fourth Annual State House Symposium on Delaware History and Culture.

TECHNICAL PUBLICATIONS

"Building Codes & Zoning Regulations and the Old House" Old-House Journal

"Planning for Historic Preservation" Delaware Planner

"Old House Sewer and Septic Systems" Old-House Journal

"House Moving" Old-House Journal

"The Old-House Bathtub" Old-House Journal

"Decorating Radiators" Old-House Journal

"Planning for Delaware's Past" Delaware Planner

TECHNICAL PUBLICATIONS

"Preservation Notes" Bi-weekly column, Daily Banner, Cambridge, Maryland.

"American Mushroom Industry: the First Fifty Years - 1880-1930," Mushroom News (Kennett Square, PA: American Mushroom Institute)

NOMINATIONS TO THE NATIONAL REGISTER OF HISTORIC PLACES

Henlopen Light Replica, Rehoboth Beach, DE., 1992
Merry Sherwood, Worcester County, MD., 1991
Ellendale Forest Picnic Facility, Sussex County, DE., 1990
Bridgeville Public Library, Bridgeville, DE St. John's Church, Sussex County, DE., 1989
Chambers House, New Castle County, DE., 1988
Fourteen Foot Bank Light, Delaware Bay, DE
Goldsborough House, Cambridge, MD
Lightship Overfalls, Lewes, DE
Marcus Hook Range Rear Light, Wilmington, DE
Montgomery House, New Castle County, DE
National Harbor of Refuge/Delaware Breakwater Historic District
Lewes, DE Reedy Island Range Rear Light, Taylor's Bridge, DE
Sycamore Cottage, Cambridge, MD., 1987
Stoever Log House, New Holland, PA., 1986
Dover Green Historic District, Dover, DE., 1985
Little Creek Hundred Rural Historic District, Kent County, DE., 1984
Historic Resources of New Hope, New Hope, PA
Historic Resources of West Whiteland Township, Exton, PA
Governor John Cook House, Smyrna, DE., 1983
Shorts Landing Hotel Complex, Kent County, DE
Historic Resources of Kenton Hundred, Kenton, DE., 1982
Schooner Maggie S. Myers, Leipsic, DE
Schooner Katherine M. Lee, Leipsic, DE
Schooner Annie R. Shillingsburg, Leipsic, DE
Historic Resources of Milford, Milford, DE., 1980

NATIONAL HISTORIC LANDMARK STUDIES

Grey Towers, Gifford Pinchoet Home, Milford, PA., 1985
Washington's Crossing Site, Washington Crossing, PA and NJ

CURRICULUM VITAE

JANET L. FRIEDMAN

TITLE Cultural Resource Services Program Manager

EXPERTISE
Cultural Resources Management
Environmental Resource Management
Program Management

EXPERIENCE WITH FIRM

Program Manager for Cultural Resource Services, 1991-Present

- Manages Dames & Moore's Eastern Division Cultural Resources Services. Manages large and small projects in archeological and historic resource survey, archival research, historic buildings assessments, and other aspects of cultural resource management. Provides cultural resource expertise to strengthen firmwide environmental support to clients.

Project Manager, 1991-1992

- Project Manager and Deputy for $9.5 million environmental support contract to Department of Defense (DoD), Strategic Defense Initiative Organization (SDIO). Managed program to provide environmental support to SDIO, including ensuring that all SDIO programs were identified, analyzed, and appropriately documented under the National Environmental Policy Act and DoD regulations, and that environmental impacts were identified and mitigated. Developed and implemented public involvement process to support an Environmental Impact Statement, including managing two public scoping meetings. Managed a staff of 30 individuals and 2 subcontracting firms and provided direct client support, technical and regulatory analysis, short- and long-range planning, and program review.

OTHER EXPERIENCE

Project Director, SRA Technologies, Inc., Alexandria, Virginia, 1987-1991

- Managed a 7.5 million dollar contract to support the U.S. Department of Energy (DOE) in planning for an environmental impact statement (EIS) for a high-level nuclear waste repository and monitored retrievable storage facility. Managed 12 in-house personnel and staffs of 3 subcontractor firms. Developed planning direction, National Environmental Policy Act documentation, issue papers, and technical support documents. Provided environmental program support within DOE, and planning for public involvement EIS scoping process. Provided technical support for archeology, historic preservation, and American Indian issues.

Senior Environmental Scientist, United Engineers and Constructors, Washington, D.C., 1985-1987

- Provided technical environmental expertise, and legislative and policy analysis to DOE in nuclear waste repository siting program. Initiated and developed historic preservation program with the Advisory Council on Historic Preservation; supported development of environmental assessments; participated in developing and implementing decision methodology; wrote management plans; participated in public meetings; environmental interface for Indian and transportation issues.

Consultant, Organization for Tropical Studies, Costa Rica, 1984-1985

- Developed and advised on mechanisms for emphasizing archeological considerations in on-going biological research in tropical forestry programs in Costa Rica. Worked with a consortium of U.S. and Costa Rican universities.

Special Assistant to the Director, Office of Cultural Resources Program, Advisory Council on Historic Preservation, Washington, D.C., 1983-1984.

- Developed tailored programs for incorporating historic preservation planning in programs of Federal, State and private agencies; developed programmatic agreements and agency opinions, conducted interagency training sessions.

Environmental Consultant, Washington, D.C., 1982-1983

- Provided technical support to World Resources Institute, Ecological Directions International, Public Administration Service, Iroquois Institute. Investigated national and international environmental issues, including historic preservation, rural development, tropical forestry, pesticides, decertification, marine resources, water management. Wrote research proposals, briefing papers and reports. Organized international symposia.

United States Department of Agriculture (USDA), 1977-1985. Served as Cultural Resource Management specialist in positions of increasing responsibility, including:

Historic Preservation Officer

- Represented the Secretary of Agriculture on the Advisory Council on Historic Preservation as Departmental Historic Preservation Officer in the Office of Institutional Affairs. Coordinated all preservation activities throughout the USDA.

Assistant Director of the USDA Office of Environmental Quality (OEQ)

- Advised the Secretary and top level policy-makers regarding natural and cultural resource issues; prepared briefing papers; developed testimony, served as technical expert at Congressional hearings, worked with Congressional staffs; provided special assistance to the director of OEQ in Departmental environmental concerns and in international environmental matters; wrote and coordinated the annual and weekly reports; assisted in developing Departmental contributions to Global 2000; monitored USDA Wild and Scenic Rivers and Wilderness programs.

Head Archeologist, USDA Forest Service.

- Coordinated historic preservation programs throughout the Forest Service. As first to hold this position, provided guidance to over 250 professional archeologists in the Forest Service. Established policy and direction for the National program; headed USDA Cultural Resources Task Group; prepared both USDA and Forest Service regulations for cultural resources; developed briefing papers, op-ed pieces, and reports.

USDA Forest Service Hell's Canyon National Recreation Area Planning Team Archeologist.

- Developed inventory and protection plans; prepared cultural resources component for management plan and environmental impact statement; prepared paleontological and archeological overviews; directed field inventory; wrote and administered contracts; directed professional symposia; planned and participated in public involvement workshops.

Research Archeologist, California State University, Chico, California, 1976-1977.

- Developed project proposals; directed archeological field inventory and excavation; carried out archeological analysis; prepared final reports; directed laboratory procedures; supervised and taught students; established new direction for the program.

Research Archeologist and Laboratory Direction, Ozette Archeological Project, 1973-1976.

- Conducted archeological field excavation and laboratory research; participated in development and design of major museum; taught field and laboratory techniques; worked with professional and amateur groups.

Teaching Assistant and Lecturer in Anthropology, 1970-1974.

- Washington State University, Peninsula College, and adult education on the Makah Indian Reservation (concurrently with work on the Ozette Project).

ACADEMIC BACKGROUND

Ph.D., Anthropology/Archeology, Washington State University, Pullman, Washington, 1975
M.A., Anthropology, University of California, Los Angeles, California, 1970
B.A., Anthropology, University of California, Los Angeles, California, 1967

PROFESSIONAL AFFILIATIONS

Society of American Archeology
Women's Council on Energy and Environment

SELECTED PUBLICATIONS

Friedman, J.L. and B.J. Little, "Protecting Cultural Resource in Managing Chemical Pollution," *Journal of Hazardous Materials*, 1992, In Press.

Friedman, J.L. "NARTs Revisited--Again." *American Archeology*. 5(3): 221-224, 1986.

Editor. "A History of the Archeological Resources Protection Act: Laws and Regulations." *American Archeology*. 5(2), 1985.

Friedman, J.L. "ARPA Law Enforcement Training." *American Archeology*. 5(2): 1108, 1985.

Friedman, J.L. "Introduction: A Drama in Three Acts." *American Archeology*. 5(2): 82, 1985.

Friedman, J.L. "The Regulations: The Early Years." *American Archeology*. 5(2): 94, 1985.

Friedman, J.L. and Daugherty, R.D. "An Introduction to the Art of Ozette." In: *Northwest Indian Art*, ed. by Roy Carlson. Vancouver, British Columbia, Canada: Simon Fraser University Press, 1983.

Editor. *Toward a Philosophy of Cultural Resources Management*. American Society for conservation Archeology, Reports, 1982.

Friedman, J.L. "The Foundation of Federal Cultural Resources Management: The National Historic Preservation Act." In: *Towards a Philosophy of Cultural Resources Management*, ed. by J.L. Friedman. American Society for Conservation Archeology, Reports, 1982.

"Introduction: Philosophy of Cultural Resources Management." In *Toward a Philosophy of Cultural Resources Management*, ed. by J.L. Friedman. American Society for Conservation Archeology, Reports, 1982.

Friedman, J.L. "Purpose and Nature of Federal Preservation." *Advisory Council on Historic Preservation Report on Federalism and Preservation*. 1982.

Friedman, J.L. "Rural Preservation: A Key to Wise Rural Land Use." *Contract Abstracts and CRM Archeology*. 3(1), 1982.

Friedman, J.L. "An Idea Whose Time Has Come." *Journal of Field Archeology*. 9: 392-395, 1982.

Friedman, J.L. "Archeological Research in the USDA Forest Service." *American Society Conservation Archeology Newsletter*. 8(4): 11, 1981.

Friedman, J.L. "Saving the Past from the Present for the Future." *American Forests*. 87(10): 26-30, 1981.

Friedman, J.L. "Archeological Resources Protection Act: Law Enforcement Training." *Anthropology Newsletter*. 22(5): 6, 1981

Friedman, J.L. "Federal Cultural Resources Management: Constraint or Opportunity?". *Journal of Forestry*. 79(3): 142-145, 1981.

Editor. *Agriculture and the Environment: Second Annual Report of the United States Department of Agriculture, Office of environmental Quality*. 1981.

Friedman, J.L. and B.R. Flamm. "United States Department of Agriculture: Its Role in Protection of Our Heritage Environment." *American Antiquity*. 46(1): 288-191, 1981.

Friedman, J.L. "The Diaz Decision and Its Effect on Cultural Resource Protection in Hell's Canyon." In: *Cultural Resources Law Enforcement: An Emerging Science*, ed. by D.Green and P. Davis. Albuquerque, New Mexico: USDA Forest Service, Southwest Region, 1980.